Towards tailored elderly care

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General discussion

7.1 INTRODUCTION

The self-assessment versions of the Groningen Frailty Indicator (GFI) and INTERMED for the Elderly Self Assessment (IM-E-SA) reflect the perspectives of elderly individuals on their frailty state and level of case complexity. Based on the scores on the GFI and the IM-E-SA elderly persons can be selected for general care programs, or – in contrast – tailored elderly care, to prevent poor outcomes. Tailored care is expected to result in better health outcomes, lower costs, enhanced care experience and better quality of life.

In this chapter the main results of the psychometric evaluations are discussed of the GFI and IM-E-SA as well as the clinical implication of these results. Next, the methodological considerations regarding the psychometric evaluations are addressed. In the next paragraph several options for screening are discussed using tools such as the GFI and IM-E-SA for tailored elderly care. This final paragraph ends with recommendations for future research and a final remark.

7.2 PSYCHOMETRIC PROPERTIES GFI AND IM-E-SA

7.2.1 Feasibility, reliability and construct validity

The GFI and IM-E-SA have been demonstrated to have good psychometric properties regarding feasibility, reliability, and construct validity (i.e. known group, convergent and discriminant validity) (Chapters 2a, 3 and 5). The results are consistent with other published psychometric evaluations of the self-assessment version of the GFI[2,3]. The results of the psychometric evaluation of the IM-E-SA could not be compared, since this thesis contained the first psychometric evaluation to date (Chapter 5).

7.2.2 Predictive validity

In an oldest old population, the GFI-score was associated with mortality, and functional decline, however it did not appear to be associated with hospitalization (Chapter 4). These results are consistent with those found in a study that evaluated the predictive value of the dichotomous GFI-score in community-dwelling elderly persons[4]. The GFI showed potential to identify elderly persons at risk, though the predictive power and test accuracy for individual risk-assessment were not sufficient[4-6]. The results regarding predictive power are concordant with those of other frailty instruments, irrespective of these measures included either a physical domain only or multiple domains[4,7,8]. These findings imply that the potential for making reliable predictions for individual elderly is limited. Nevertheless, the GFI in combination with gender and morbidity has shown to be a valuable tool for risk assessment of poor outcomes at group levels in the oldest old population (Chapter 4).

Moreover, further evaluation showed that the GFI and IM-E-SA were statistically significantly associated with total healthcare costs one year later. Including adjustments for other individual characteristics (e.g. physical and psychological morbidity), one unit increment in GFI-score or IM-E-SA-score was associated with a fifteen percent and six percent increase in healthcare costs in the follow-up year, respectively. In addition, the GFI was a predictor of long-term care costs which is in line with the concept of frailty. Dependence due to physical dysfunctions, cognitive impairment, psychological distress and/or social dysfunctions corresponded with need for support in performance of daily activities in an elderly person's living environment. The allocated long-term care aims to maintain frail elderly persons in their own homes as long as possible, or preserves dignity with acceptable levels of quality of life in nursing homes. In contrast with the GFI, the IM-E-SA was a significant predictor of curative care costs: costs related to hospital treatments and hospital admissions. This result is congruent with the measure of case complexity as it measures biopsychosocial healthcare needs.

7.2.3 Clinical implications

Chapter 4 showed that from a public health perspective the GFI is suitable for predictions for mortality and functional decline on a group level. Therefore, use of the GFI could be beneficial for policy makers of public health, hospitals, and primary care as its incidence may be estimated and appropriate care provisions can be made.

Healthcare costs will increase globally and governments aim to contain their healthcare budgets[9]. Planning of capacity and finance of care can be improved by assessment of frailty or case complexity scores as these self-assessment measures contributed to almost half of the explained variances of the corresponding prediction models for total healthcare costs. These are impressive contributions of the sole predictors GFI and IM-E-SA. By adding other significant predictors (i.e. gender, living situation and morbidity) to both prediction models, the explained variance increased to forty percent (Chapter 6). This highlights the value of this innovative approach as no other prediction models included self-assessment measures of frailty or case complexity as predictors and showed similarly strong results in predictive validity. However, other predictors like informal care or domestic home care are also associated with the use of healthcare services and therefore healthcare costs[10,11]. It is possible that some of these 'non-medical' costs are concentrated among elderly groups with characteristics which could not be assessed in this thesis. Perhaps, by including those predictors in the multivariate model along with the predictors GFI or IM-E-SA the explained variances would increase even more.

Chapters 2a and 5 showed a more clinical approach as the GFI and IM-E-SA differentiate between outcomes and target those frail or case complex elderly persons for care interventions. While those who are non-frail or non-case complex could be managed safely with standard care (e.g. watchful waiting approach).

7.3 METHODOLOGICAL CONSIDERATIONS

7.3.1 Data collection

All data sets analyzed in this thesis were collected with self-assessment questionnaires. Although the majority of the elderly respondents completed all items of the GFI and IM-E-SA, it is still unclear which characteristics are associated with non-response. Therefore it remains unknown to which extent selection bias occurred (Chapter 2a and 5). It is likely that elderly persons with an interest in their own health status and with fewer disabilities were more able and willing to participate in those studies. Moreover, self-assessment measures may not be feasible for elderly persons with (mild) cognitive impairment.

7.3.2 Statistical analyses

In the multivariate models for the prediction of poor outcomes and healthcare costs, the continuous scores of the GFI and IM-E-SA were added as independent variables. Those continuous scores are preferred in multivariate regression models as dichotomization of variables reduces the power of the analyses[12]. However, in clinical settings the use of a dichotomous score is preferred in daily practice to differentiate persons into useful categories and apply different care pathways accordingly (Chapters 2a and 5). Besides the continuous scores of the measures, other predictors were also considered in the final multivariate prediction model if the predictors had a p-value of ≤ 0.15 for poor outcomes (Chapter 4). Rather arbitrarily, values for alpha greater than 0.05 are frequently used to drop variables from prediction modeling to limit bias in the predictor coefficients[13,14]. The GFI-prediction model for poor outcomes was developed in a relatively small oldest old population. Therefore, bootstrapping techniques were used for over-optimism of the model's performance in the derivation data. Bootstrapping techniques have shown superiority over other approaches to address these problems such as split-sample or cross validation methods[15].

The GFI-prediction model for healthcare costs was developed in a larger sample size and therefore a different approach was used for prediction model development. Potential predictors were included in the final model if their p-value was ≤0.15 in the univariate analyses. Subsequently, with a backward stepwise selection method the final predictors were included in the multivariate model if their p-value was ≤0.05. This method decreased the change of a type I error and is therefore more preferred in prediction modeling development.

7.3.3 Predictors

Besides the GFI and IM-E-SA-scores also other individual characteristics were shown to be significant predictors of healthcare costs or poor outcomes. Chapters 4 and 6 showed similar significant predictors: e.g. gender, morbidity and living situation. Being male was statistically significantly associated with poor outcomes and healthcare costs, compared with females. Next, morbidity as such is not a preferred predictor as it has heterogeneous patterns and severity of conditions, producing distinctive cumulative effects for each individual[16]. In addition, living situation may not be considered a predictor but an outcome in itself. It would appear that admittance to a nursing home can be considered an adverse outcome since institutionalized living elderly have a higher risk for mortality and adverse health events.

From the literature some other predictors for poor outcomes were introduced, but unfortunately these were not collected for our data analyses. For example, presence of poor oral health as this condition has an increasing impact on an individuals' general health. Dental and periodontal diseases have a negative impact on the progression of chronic diseases, nutrition and even quality of life[17-20]. The lack of attention for oral care might be a hidden health hazard, since the number of elderly with remaining teeth is expected to increase due to improved level of dental care and awareness during an individuals' active life compared to previous generations[17].

In Chapter 6 the socio-economic status of the elderly persons in Lifelines was assessed in terms of education level, though no further data were collected on (health) illiteracy. Moreover, financial fragility (e.g. debts) was also not included in the prediction modeling. Both determinants may well be associated with poor outcomes as these are related to stressful living and working environments, poor social support, worse health-related behaviors, and poor access to healthcare[21-24].

In Chapter 6 predictors of informal care or domestic home care could not be added to our data analyses though these have been associated with healthcare costs[10,11].Possibly these types of care could have either a positive association (e.g. extensively defined healthcare demands) or negative association (e.g. no care demands as care is provided by relatives of neighbors to the dependent elderly persons) with healthcare costs.

7.4 SCREENING FOR FRAILTY AND CASE COMPLEXITY

7.4.1 Screening for frailty and case complexity

Screening in elderly populations for frailty will help to identify those elderly persons who have a higher risk of adverse health outcomes. By targeting frail elderly persons for interventions, healthcare professionals are in a better position to balance the risks and benefits of medical treatment (e.g. starting a new drug, hospital admission or an elective joint replacement) and avoid unnecessary harm to an elderly person[25]. Moreover, interventions may be taken to prevent or reduce decline in physical, psychological, cognitive and social functions. Furthermore no specific interventions may be required for individuals identified as non-frail, as care as usual may be sufficient.

Screening for case complexity helps to identify those elderly persons who have biopsychosocial healthcare needs. Subsequently a care intervention can be provided to establish better coordinated and integrated healthcare[26-28].

7.4.2 Screening criteria

When considering whether screening is (cost-)effective, evaluation of the following criteria has been proposed[29]:

- The disease or condition is a prevalent and serious health problem;
- The natural course of the disease is known;
- There is a pre-clinical phase in which to diagnose the disease;
- Treatment is available to improve diagnosis;
- There are tests to find the disease in the asymptomatic phase;
- Costs for screening, case finding, treatment and care are financially viable[29].

These criteria for screening are based on a biomedical principle, which does not fully correspond with frailty and case complexity, since these concepts also incorporate other domains like psychosocial needs. Only the first criterion appears to be met as frailty and case complexity are prevalent age-related conditions. Frailty and case complexity can be caused by several underlying conditions, consequently there is no uniformity in being frail or case complex. Therefore, the GFI and IM-E-SA should not be considered a simple diagnostic tool. The outcomes are not suitable to indicate a single standard type of care intervention. There are no standard interventions and there will probably never be an adequate 'one size fits all' care intervention for selected frail or case complex elderly persons. Both instruments do however provide insight in specific aspects of vulnerability and specific needs that may be used to provide tailored or personalized care.

7.4.3 Population screening

Population screening on frailty or case complexity will report the prevalences of both geriatric conditions. The total score could be used as a benchmark for other international populations. The gathered information may be beneficial for researchers and policy makers. Though this screening method is very informative it is also costly, since all elderly persons of a population should be repeatedly screened[8].

Chapter 3 presents comprehensive overviews of GFI-scores of 6,000 elderly persons who participated in the cohort study of LifeLines. The LifeLines cohort confirmed the results of the known group validity of Chapter 2a. The large sample size and comprehensive assessment of individual characteristics showed that living situation, morbidity (e.g. either psychological or physical) and obesity showed the strongest associations with frailty. The GFI comprises all these determinants in its measure, except for obesity. Since a GFI-item focuses on unwilling weight loss as this reflects loss of muscles strengths and mass[30] it would be interesting to investigate if obesity in contrast with weight loss is a better predictor of poor outcomes.

7.4.4 Opportunistic screening

Opportunistic screening would involve screening for frailty or case complexity in every elderly patient consulting the primary clinic[8]. This method could be beneficial as 88% of all elderly persons visited the primary care clinic regularly (Chapter 3). Using the GFI and the IM-E-SA, older adults with scores indicating increased risk could be selected for tailored interventions. However, previous studies with a similar approach did not find positive results (yet). For example, Metzelthin and colleagues included twelve primary care clinics and randomly allocated six practices to continue care as usual and six practices to provide tailored interdisciplinary care with the Prevention of Care approach[31]. Elderly patients were included if they had a GFI-score of ≥ 5. During the follow-up period of two years no differences were observed between the intervention group and the control group with regard to disability, depressive symptoms, social support interactions, fear of falling, and social participation[31].

Also, the Embrace-study combined the scores of the GFI and IM-E-SA to categorize elderly subgroups according to the following strata: robust (A), frail (B) and complex care needs (C)[32,33]. Afterwards, elderly persons were randomized per stratum to care as usual or an integrated care intervention. This intervention involves an Elderly Care Team per general practitioner practice, an Electronic Elderly Record System, decision support instruments, and a self-management support and prevention program - combined with care and support with intensity levels increasing by three strata[33]. Currently, the data

of this study is being examined to assess the effectiveness on patient outcomes, service use, costs and quality of life.

Finally, Eissens-van der Laan and colleagues categorized elderly persons with separate items of the GFI and IM-E-SA in five segments: feeling vital, difficulties with psychosocial coping, physical and mobility complaints, difficulties experienced in multiple domains and feeling extremely frail[34]. No further results are available, since presently tailored care pathways for the corresponding segments are under development.

7.4.5 Stepwise screening

Stepwise screening of frailty and case complexity could be another option to allocate geriatric care resources efficiently. Bleijenberg and colleagues developed the following strategy: the first step involved identification of an elderly patient's health deficits based on data from an electronic patient file[35]. The second step included self-assessment with the GFI for those patients with a high number of health deficits[35]. Subsequently, patients with high scores on both measures might benefit from a comprehensive geriatric assessment and afterwards tailored, proactive care by a geriatric nurse will be provided[35]. Up till now, there is no evidence for this new strategy as the study is still in progress[36].

7.5 FUTURE RECOMMENDATIONS

Some recommendations are proposed for future research incorporating the GFI and IM-E-SA. These recommendations consider further psychometric evaluations, care intervention development and evaluation.

7.5.1 Feasibility

The GFI and IM-E-SA were evaluated with good feasibility. However, further research is recommended to assess which characteristics the non-responders have since these persons could be care avoiders[35]. On the other hand, non-responders might also be robust persons who do not appreciate assertive care treatment.

Another less time consuming method to assess frailty or case complexity is assessment of those concepts using web-based questionnaires for mobile devices and smartphone-apps. Afterwards, the GFI and/or IM-E-SA-scores could be imbedded in electronic health The imbedding of those measures into knowledge management systems should be routine features of healthcare delivery to ensure that decisions made by clinicians and patients are informed by current best evidence[1].

7.5.2 Reliability

Future longitudinal studies should evaluate the intra-rater agreement (i.e. completion of the measure by the same respondent with repeated administrations) of the GFI and IM-E-SA, this method is an indication of the reproducibility over time and temporal stability of those measures.

Regarding further evaluation on reliability of the GFI, it is recommended to assess the inter-rater agreement between the professional and self-assessment version of the GFI. The items of the GFI objectively assess losses in several domains and therefore one would expect that an elderly individual and healthcare professional show a good inter-rater agreement. The inter-rater agreement between the IM-E-SA and IM-E was substantial, yet, revealed that elderly persons evaluated their situation as less case complex and therefore tended to underestimate their problems. On the other hand, healthcare professionals could be overestimating healthcare needs of elderly patients based on their own clinical judgment. It may well be that due to the subjective assessment of case complexity, the level actual of case complexity is somewhere in the middle between both ratings.

7.5.3 Predictive validity

The continuous scores of the GFI and IM-E-SA showed satisfactory results on the prediction of individual healthcare costs. However, the power of the GFI to predict poor outcomes in an oldest old population was less satisfactory on an individual level. Individual prediction could be more accurate by calculating a new prediction model as not all GFI –items were statistically significantly associated with poor outcomes (Chapter 4). Possibly, per population (e.g. home dwelling elderly or institutionalized living elderly) and even per prediction of a poor outcome a different set of GFI-items may be part of the prediction algorithm and also the assigned weights of the items may vary. A more rigorous approach could be to eliminate those GFI-items with no associations with poor outcomes and replace these with new items. New items could be based on individual characteristics which have been proven to be significant predictors of poor outcomes in several elderly populations. For example, items about provision of care (e.g. informal or domestic) or oral health could be included.

There is a case to be made for further investigation in developing similar prediction algorithms of IM-E-SA. However, a preceding step should be the evaluation of the predictive validity of this measure on poor outcomes.

Besides the predictive value of the continuous total scores of the GFI and IM-E-SA, whether or not calculated with algorithms, or replaced by new items, research is also recommended on the dichotomous score of both measures. Dichotomous scores are preferred in daily practice to segment elderly persons into categories eligible for different care pathways or interventions (Chapters 2a and 5). The commonly used cut-off scores for both measures were based upon a consensus by a panel of clinicians[37,38]. Moreover, the cut-off scores of both measures were evaluated with cross sectional data as shown in Chapters 2a and 5. Preferably, future longitudinal studies should assess optimal cut-off points for both instruments. Possibly, optimal cut-off values vary according to elderly populations and poor outcomes evaluated. Moreover, cut-off scores depend on subsequent treatment and combined (cost-) effectiveness[39].

7.5.4 Intervention development

A new approach could be to use scores of separate domains or single items of the GFI or IM-E-SA as input for tailored care interventions. This content based approach could be applicable for elderly persons who are identified as frail or case complex. However a single item, for example the cognitive item of the GFI, could also be valuable to allocate care interventions in the short term. These interventions should be designed to prevent poor outcomes and simultaneously improve quality-of-life and quality-of-care for elderly persons.

Despite the fact that the GFI and IM-E-SA identify dependences and needs in different concepts, the interventions to decrease these problems might be comparable. For example, a personalized medication review could be valuable for elderly persons identified with polypharmacy with the GFI, and for those with multi-morbidity in the IM-E-SA[25].

An intervention to improve self-management abilities with a focus on psychosocial activities, would be useful for those persons identified with psychosocial related complaints in either measure. Such an intervention may strengthen an individual's wellbeing[40]. Moreover, those elderly persons who are involved in a social network are more likely to get some support in daily activities (e.g. assistance in grocery shopping) or receive informal care from e.g. relatives, friends or neighbors. Due to the upcoming overhaul of the Dutch healthcare system, the requirements for receiving formal home care will drastically change. This will lead to less formal home care, and an increase in dependency on informal care for those that prefer to remain living independently. In addition, the access to institutionalized care for elderly persons will also be severely restricted in The Netherlands. The expected results of these policy changes can be mitigated, at least partially, by these psychosocial activities. If this intervention does not lead to the required results, an easily accessible (virtual) helpdesk, organized in local jurisdictions, to inform elderly persons about local home care provisions, could be helpful.

Chapter 3 showed that obesity was strongly associated with frailty. This would appear to call for a weight loss intervention. This could involving referral to a physiotherapist and/or dietician. However an additional option is to develop physical activity interventions. These interventions should be developed with incorporation of fun, enjoyment and social support to improve adherence and participation[41], and should not be restricted to certain age groups. This may require adaptations for some sports (e.g. martial arts and dancing classes). These physical related interventions should also not be restricted to obese frail elderly persons. As it strengthens muscles and bones, resulting in better balance and reduced falls, physical activities are beneficial for all elderly persons. Combining physical activities with increasing the familiarity of elderly persons with modern technology, other active leisure-time activities could be introduced, such as geo caching (high-tech treasure hunt using global position system) outdoors or interactive gaming indoors.

Chapter 5 showed that care interventions may be necessary on the short term, based on a single IM-E-SA-item. This need can be integrated in a tailored care plan. For example, the IM-E-SA identifies problems with the cooperation between healthcare professionals in different disciplines. A targeted intervention could be to appoint a case manager for managing and coordinating care for an elderly patient.

7.5.6 Evaluation of interventions

Evaluations of tailored care interventions for frail or case complex elderly persons are commonly evaluated in terms of poor outcomes (i.e. mortality, hospitalization or institutionalization) or (cost-) effectiveness. However, up till now it is unclear whether these outcomes are equally important for elderly individuals. Elderly persons may vary in treatment preferences and may have different desired levels of involvement. Accordingly, it is important to investigate their preferred outcomes, treatments and care pathways[42]. The latter will become increasingly important to use in the supportof shared decision-making with a healthcare professional, e.g., to develop a tailored healthcare plan[42,43].

Experimental study designs like a randomized controlled trial are recommended for tailored care interventions for three reasons: there is a lack of golden standards for frailty and case complexity, the population of elderly persons is heterogeneous, and there is a lack of evidence-based interventions. This type of design requires an optimal implementation of the study protocol. This could be challenging for the healthcare professional in daily practice[31]. An alternative valuable research design to conduct in elderly care is a nonrandomized observational study, for example a cohort or case control design. When appropriately conducted, these studies can provide researchers and elderly persons with a more realistic expectation for outcomes in real-world environments, than traditional randomized controlled trials[44]. However, less adequately designed observational studies may have limited validity due to confounding and selection bias. Important issues like an appropriate control group, possible confounders and biases, and proper data collection, need to be settled beforehand.

7.5.7 Final remark

this thesis showed how several intervention studies are currently in progress, which use the GFI and/or IM-E-SA-scores for input for tailored elderly care[32,34,36,45]. The majority of these studies are still in progress and therefore the effectiveness of these interventions, nor the (cost-) effectiveness, is presently unknown. However, one study has shown no effectiveness of a tailored care intervention. This negative result was partly explained by practical implementation problems. More importantly, this study brings to light the challenge in developing and evaluating care interventions in community-dwelling elderly persons[31]. Hopefully, subsequent trials will solve these practical and methodological issues. This is of major concern as a new generation of elderly persons (i.e. Baby Boomers) is arriving who will extensively use healthcare resources. This generation is entitled to receive evidence based tailored care as they do deserve an ageing process with dignity, fulfillment and enjoyment in life.

7.6 REFERENCES

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